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A STUDY OF THE INCIDENCE, NATURE AND CAUSE OF
FOOTBALL INJURIES IN THE CITY OF EDMONTON DURING 1969

by



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A THESIS

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THE DEGREE OF MASTER OF ARTS

DEPARTMENT OF PHYSICAL EDUCATION

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "A Study of the Incidence, Nature and Cause of Football Injuries in the City of Edmonton During 1969" submitted by Lawrence Walter Dufresne in partial fulfilment of the requirements for the degree of Master of Arts.

Date *June 24, 1971* . . .

ABSTRACT

The purpose of this study was to investigate the incidence, nature and possible causes of recorded football injuries so that preventative measures and procedures could be implemented in the future.

An accident report form was specifically designed for the study. The form was comprised of twenty-five sections relating to individual body factors, injury factors, equipment factors, and environmental factors. The report form was designed to allow for computer analysis of all sections and factors. Utilizing Fortran IV language, the computer analysis was completed on an I.B.M. 360/67 computer.

The sample consisted of 1549 players from thirty-eight teams representing the professional, intercollegiate, high school, and bantam levels.

Within the limitations of this study, the following conclusions have been made. The injury rate of football players in the City of Edmonton during the 1969 football season was 36.9 per cent. Approximately 20.0 per cent of the players injured received more than one injury during the season. The majority of all injuries were in the high schools, however there were more participants at this level.

Young persons (twenty years of age and under) suffered the majority of injuries. Defensive halfbacks received more injuries than those in any other position.

As indicated in previous studies, the knee and ankle were the body regions most frequently injured. The majority of these were sprains and strains. Bruises and fractures were not uncommon.

Collision with players and falls and trips resulted in the majority of injuries. Most of these injuries occurred during games.

Those players who executed blocks and tackles received the majority of injuries, while those players who received blocks and tackles were also often injured.

The rate of injury was higher at the beginning of the football season. Injuries occurred more frequently in the second half of practices than in the first half. The more serious injuries were also more common during the second half of practices. The injury rate was relatively constant throughout the four quarters of the games.

Over 18.0 per cent of the players injured incurred a similar previous injury. These players received mainly re-occurring knee, ankle and shoulder sprains as well as neck and lower back strains.

Facial injuries were common to those players wearing cage-type facemasks as well as to those wearing double-bar facemasks.

Doctors were not present for the majority of injuries, which included the more serious injuries such as fractures, dislocations-separations, and concussions.

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CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

Since 1931 the American Football Coaches Association (1) have made statistical reports on the fatalities in football. However, in football many disabilities occur that do not result in death but require treatment and absence from practice or games. A great need exists for an accurate tabulation on a national scale of all injuries resulting in disability for more than one day incurred in each sport. Thorndike (2:1126) has suggested that the problem of obtaining the necessary data for computation is one of organization. Thorndike has stated,

Except for those of isolated educational institutions, such reports are now unattainable. Reports in medical literature are varied and usually concern particular types of injury.... Such a large base for statistical compilation would furnish data of great value to those interested in the reduction of the incidence of injury in sports competition. I believe that the current incidence of injury is too high and should and can be abolished. (2:1126)

Thorndike has indicated that there is a need for a statistical compilation of injuries on a national scale that requires deep thought and cooperation from all sides of the field: the professional, the amateur, the schools, and those responsible for sports in public and private playgrounds.

There have been at least two critical periods in the history of football when the public demanded abolition of the sport because of its brutality and the high mortality rate. Seaton et al. (3:220) has stated that, "with the possible exception of boxing, no other sport has raised

the ire of the American public to the extent that the rules have been modified to protect players."

The Problem

The purpose of this study was to determine the incidence of football injuries in the City of Edmonton and to examine the nature and possible causes of all recorded accidents so that effective and meaningful suggestions could be implemented in order to reduce the incidence of injury in subsequent years.

The Need for the Study

At the time the study was undertaken, no current reports on football injuries in Canada were available to the public. Such a report was deemed desirable.

There was a need to ascertain if football injuries found in a Canadian city could be equated to national reports obtained from the United States or if, perhaps, the type of injury occurring tended to be peculiar to one level or team.

Administrators of the various levels and teams in Edmonton had limited information on the causes and incidence of football injuries in their area. Any information which would enable them to enhance their program by lowering the number of football injuries would be beneficial to all.

There was a need to develop a simple, yet comprehensive injury report form from which valuable information relative to football injuries could be derived. Within the limitations of the study, such a form was developed. The form was designed to permit computer analyses of recorded information.

Delimitations

In carrying out the study, a number of restrictions had to be placed on the sample and the study. The delimitations were:

1. thirty-eight organized, twelve-man tackle football teams within Edmonton, were considered. Teams chosen represented the bantam, high-school, junior, intercollegiate, and professional levels.
2. the study included only the 1969-70 football season.

Limitations

In addition to the delimitations stated above, certain limitations became evident as the study progressed. These included the following:

1. only those players who missed part of a practice or game, who received medical treatment, or who were restricted from practice due to an injury, were considered.
2. the injury diagnosis by trainers, coaches, or physicians were assumed to be accurate.
3. while the report form appeared to be clearly stated, respondents may have misinterpreted some areas and in doing so gave improper information.
4. there may have been error in the process of collecting, interpreting, and summarizing the accumulated data.

Definition of Terms

Incidence of Injury. The rate or frequency of occurrence of football injuries. This rate is expressed as a percentage or as so many injuries per 1000 or 100,000 player exposures.

Nature of Injury. The type of injury sustained in the football accident, e.g. knee sprain, ankle fracture, laceration.

Cause of Injury. An aetiological analysis of an injury. In most instances the cause or causes given reflected the opinions of the team trainer or coach.

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CHAPTER II
REVIEW OF THE LITERATURE

Incidence of Football Injury

Over the past four decades, several studies of the incidence, nature, and/or cause of football injuries have been completed in the United States. No comparable work has been undertaken in Canada.

In a 1929-32 survey of 122 Massachusetts high schools, Burnett and O'Brien (1:95) reported a 10.4 per cent football injury rate. For 20,371 participants, 2,124 injuries occurred. The principal findings of this study are given in Table I. No deaths were directly attributable to football.

TABLE I
Massachusetts High-School Football Injuries

	1929	1930	1931	1932
Number of Boys	4,319	5,456	4,616	5,980
Number of Schools	93	106	92	103
Number of Injuries	504	549	528	543
Number of Major Injuries	199	175	212	171
Number of Minor Injuries	305	374	316	372
Percentage of Injuries	11.4	10	11.4	9.1
Percentage of Major Injuries	4.8	3.2	4.6	2.8

Neilson's 1932 study of California high school football (2:283) reported a 22.2 per cent injury rate. For 13,559 participants from 281 schools, 3,171 injuries were incurred by 3,003 individuals. A summary of Neilson's results is given in Table II.

TABLE II
Percentage of Boys Injured of Those Playing

Age Groups	Number of Boys Not Injured	Number of Boys Injured	Total Number of Boys Who Played	Percentage Injured of Boys Playing at Each Age Level
No Age Given	8	2	10	20.00
12-0 - 12-5	1	0	1	00.00
12-6 - 12-11	7	0	7	00.00
13-0 - 13-5	21	1	22	4.54
13-6 - 13-11	117	18	135	13.33
14-0 - 14-6	351	37	388	9.54
14-6 - 14-11	565	72	637	11.30
15-0 - 15-5	872	140	1,012	13.83
15-6 - 15-11	1,153	223	1,376	16.21
16-0 - 16-5	1,470	347	1,817	19.09
16-6 - 16-11	1,474	365	1,839	19.84
17-0 - 17-5	1,445	509	1,954	26.05
17-6 - 17-11	1,183	461	1,644	28.04
18-0 - 18-5	857	361	1,218	29.64
18-6 - 18-11	502	189	691	27.35
19-0 - 19-5	289	135	424	31.84
19-6 - 19-11	153	82	235	34.89
20-0 - 20-5	50	38	88	43.18
20-6 - 20-11	29	20	49	40.82
21-0 - 21-5	7	2	9	22.22
21-6 - 21-11	0	1	1	100.00
22-0 - Over	2	0	2	00.00
Totals	10,556	3,003	13,559	22.15

Neilson further classified each injury into an A or B category. Although the definition of each category was not explicitly defined, the A

category was considered to contain the most serious injuries. An age group summary of each classification of injury is given in Table III.

TABLE III
Number of Injuries by Age Levels

Age Levels	Number of Class "A" Injuries	Number of Class "B" Injuries	Total Number of Injuries	Percentage of Class "B" Injuries of Total Number of Injuries
No Age Given	1	1	2	50.00
12-0 - 12-5	0	0	0	00.00
12-6 - 12-11	0	0	0	00.00
13-0 - 13-5	1	0	1	00.00
13-6 - 13-11	12	6	18	33.33
14-0 - 14-5	24	14	38	36.84
14-6 - 14-11	61	12	73	16.44
15-0 - 15-5	107	37	144	25.70
15-6 - 15-11	155	80	235	34.04
16-0 - 16-5	252	119	371	32.07
16-6 - 16-11	258	123	381	32.25
17-0 - 17-5	387	153	540	28.33
17-6 - 17-11	332	161	493	32.65
18-0 - 18-5	242	142	384	37.00
18-6 - 18-11	128	72	200	36.00
19-0 - 19-5	91	49	140	35.00
19-6 - 19-11	57	30	87	34.48
20-0 - 20-5	30	10	40	25.00
20-6 - 20-11	17	4	21	19.05
21-0 - 21-5	2	0	2	00.00
21-6 - 21-11	0	1	1	100.00
22-0 - Over	0	0	0	00.00
Totals	2,157	1,014	3,171	31.97

A 1931-35 series of surveys on several college activities by Lloyd et al. (3) revealed a football accident rate of 87.9 and a days lost rate of 512.2 per 1,000 exposures. Football was the most dangerous of the

sports included.

Gonzales (4), collecting the incidence of sports fatalities in New York City from 1918 to 1950, found football to account for 21.2 per cent of all fatalities. Baseball contributed to a larger percentage of fatalities with 41.3 per cent. No relative participation figures were provided.

Patton (5) reported on 2,000 injuries to members of 1947-57 Ohio State University football teams. Of this total, 33 per cent led to missed practices, whereas 1.3 per cent required surgical correction. Injury and normal illness did not produce different percentages of time lost from practices.

California high school football injuries for 1961 were studied by Alley (6). Data was provided from insurance files. Of 19,413 players, 4,829 or 24.9 per cent had sustained injury.

From a student population of approximately 800 at Philips Academy in Andover, Massachusetts, Clark (7) reported 4,474 sports injuries for the period 1956-63. Football contributed 1,062 cases or 23.7 per cent of the total.

A relatively high football injury rate of 62.4 per cent was observed by Allen (8) in a 1965-66 study. Of 465 participants (service personnel), 290 or 62.4 per cent were injured. Of these injuries, 38.3 per cent were considered serious. No deaths were reported.

Collins' (9) 1960 Temple, Texas survey of junior high school contact-sports injuries, attributed the largest incidence to football. Conclusions were limited by a relatively small sample.

A 1965-67 study of high school sports injuries in the Edmonton Public School System by Mendryk and Dickau (10) revealed 67 of 360 or 18.7 per cent of the total number of injuries to have resulted from football.

Touch and tackle football were not distinguished.

The American Football Coaches Association has annually surveyed and investigated football fatalities at all levels since 1931 (11). Football injuries have accounted for a yearly average of 18.7 deaths. High school and college football, which included the largest proportion of participants, had a rate of three deaths per 100,000 exposures.

Nature of Football Injuries

Burnett and O'Brien (1) noted that the majority of football injuries were to the lower extremities. Sprained ankles were the most frequent, followed by sprained knees. No figures were given. Concussions contributed 3.8 per cent while less than 1.0 per cent were neck-spinal injuries.

Bruises accounted for 21.7 per cent of injuries in the study by Neilson (2). Sprained ankles contributed 15.4 per cent while another 8.8 per cent were sprained knees. Sprained shoulders were found to be 5.3 per cent of the total followed by concussions at 1.8 per cent.

Patton (5) revealed a 25 per cent rate of knee injuries, while ankle injuries were 14.3 per cent and shoulder injuries 14.3 per cent. Head injuries contributed another 10 per cent.

Alley (6) found head injuries to account for 4 per cent. Comparing this figure with that of an earlier study by Forsythe (12), Alley found a reduction in head injuries of more than 57 per cent. Further comparison revealed a 73.4 per cent decline in facial and dental injuries.

Knee injuries accounted for 27.5 per cent of all injuries in a study by McPhee (13) of Princeton University football from 1933-55. Of 194 knee injuries, 21 per cent had noteworthy annoyance to report five to twenty-seven years after graduation.

A review of 1961-62 U.C.L.A. football injuries by Blazina (14), revealed that thigh and knee injuries, mostly in the form of contusions, accounted for 4.6 per cent and 9.9 per cent of the total, respectively. A subsequent study by Blazina (15) from 1959-65, indicated an 11.6 per cent head and neck injury rate. Sprained ankles followed at 5.2 per cent.

Clark (7) summarized all significant sports injuries of high school athletes from 1956 to 1963. Table IV presents a summary of Clark's findings.

TABLE IV
Sports Injuries 1956-1963.

	Fractures	Dislocations	Concussions	Lacerations	Abrasions	Sprains	Strains	Contusions	Total
Football	150	9	36	55	93	234	132	353	1062
Soccer	58	--	18	37	57	131	101	294	696
Cross Country	7	--	--	--	9	6	32	1	55
Basketball	85	7	--	35	41	87	48	77	380
Tennis	2	--	--	1	20	11	22	24	80
Hockey	36	--	7	77	48	39	76	135	418
Track	20	--	--	30	174	91	204	61	580
Skiing	17	11	1	5	30	21	25	41	140
Wrestling	5	2	--	--	30	44	54	54	189
Squash	--	--	--	24	27	19	34	28	132
Lacrosse	33	1	1	39	46	69	68	163	420
Baseball	21	9	4	24	62	49	74	59	302
Crew	--	--	--	1	--	3	16	--	20
Total	434	28	67	328	637	804	886	1290	4474
Yearly Ave.	54	4	8	41	80	100	111	161	559

Of the total number of reported football injuries, contusions represented 33.2 per cent, while sprains and fractures accounted for 22 per cent and 13.1 per cent, respectively. Strains accounted for 12.4 per cent. Concussions were relatively infrequent representing 3.4 per cent of the injuries.

Reviewing 1955-65 football injuries at Williams College, Coughlin and Baker (16) found a shoulder injury rate of 10 per cent, relatively less than the 14.3 per cent figure cited by Patton (5).

Tables V and VI represent the principal findings of Allen's study (8) as to the nature of football injuries.

TABLE V

Characteristics of Total Injuries by Area Injured

Area Injured	Total No. of Injuries	No. of Major Injuries	% of Major Injuries	No. of Hospi- talized Players	No. of Operations	No. of Players Out for the Season
Knee	62	33	30	20	13	30
Ankle	46	25	22	4	2	13
Forearm-wrist- hand	36	11	10	2	2	5
Shoulder girdle	33	13	12	1	0	7
Skin	20	0	0	0	0	0
Upper arm-elbow	16	5	4	1	1	2
Thigh	15	3	3	0	0	1
Spine-back-neck	12	3	3	2	0	3
Foot	12	6	5	1	0	1
Chest	10	5	4	1	1	1
Craniocerebral	8	1	1	4	0	0
Leg	7	1	1	1	0	2
Face-dental	5	3	3	0	3	0
Pelvis-hip-groin	5	2	2	1	0	0
Abdomen	3	0	0	0	0	0
Total	290	111	100	38	22	65

TABLE VI
Characteristics of Total Injuries By Type

Type of Injury	Total No. of Injuries	No. of Major Injuries	% of Major Injuries	No. of Hospi- talized Players	No. of Operations	No. of Players Out for the Season
Abrasions and lacerations	16	0	0	0	0	0
Contusions	86	11	10	5	0	1
Strains	42	8	7	2	0	4
Sprains	80	45	41	17	13	33
Dislocations	10	9	8	4	1	8
Fractures	18	15	13	4	3	11
"Others"	38	23	21	6	5	8
Total	290	111	100	38	22	65

Contusions were widely distributed over the body and accounted for 30 per cent of the injuries. Sprains, mainly to the knee and ankle, represented 28 per cent while strains contributed a further 14 per cent. Six per cent were fractures while dislocations represented another 3 per cent. Spine and back injuries were relatively infrequent at 4 per cent.

Dickinson and Schramel (17) reported 261 football concussions at sixty-three colleges in 1966. This figure represented an average of four concussions per squad, less than the eight per team expected by the colleges' trainers.

Knee and ankle sprains were the most frequent of football injuries reported by Collins (9). Contusions and fractures were next in frequency, however figures were not given.

A 1964-65 study of football injuries by Snook (18) at the University of Massachusetts revealed that of 164 major injuries 24.4 per cent were head injuries, 18.9 per cent were knee injuries, and 18.9 per cent were neck injuries. Ankle injuries represented 11.6 per cent while shoulder injuries accounted for a further 6.1 per cent.

Contrary to Schneider's et al. (19) report on hyperextension injury and the hyperflexion injury found by others (6, 20), Snook (18) and Chrisman et al. (21) found the lateral-flexion neck injury (where the neck is laterally flexed to one side) to be the most common type of neck injury.

In 1968, the American Football Coaches Association (11) reported that all direct fatalities in football resulted from injuries to the head, neck and spinal cord. This figure was an increase to the 78 per cent figure of the 1963 Survey (22) and the 96 per cent found by the 1967 Survey (23). Since 1947, the head and face area accounted for 65 per cent of fatalities, the spine for 17.1 per cent, and abdominal-internal for 17.9 per cent (11).

Cause of Football Injuries

Direct line play, blocking, and tackling resulted in the majority of football injuries as reported in Gonzale's study (4). Other sources included kicks, falls, trampling, torsion and crushing forces.

Schneider et al. (19) and others (9, 20) attributed the cause of the upward trend of head and spinal cord injuries to the facebar, which appeared to be a major factor in misdirecting the forces applied to the helmet. Others have also recommended that the facebar be either changed or abolished (9, 19, 20).

Alley (6) attempted to give a comprehensive report on the causes of head injuries in football. Almost 61 per cent of the players with head injuries and 44 per cent of those with neck injuries were taught to "spear" (the practice of head-blocking and tackling). Injuries resulting from a blow from the opponent's knee or thigh accounted for almost 25 per cent of all head injuries. Tackling produced the majority of head injuries, followed by ball-carrying and blocking, respectively. In over 70 per cent of head and neck injuries the player was involved in less than seven days of pre-season conditioning before beginning scrimmage, while in 16 per cent the player had not engaged in any conditioning exercises. Neck injuries occurred during practices at a rate of 54 per cent, while head injuries in games accounted for 56 per cent (6).

Several studies suggested the helmet does not prevent head injuries altogether, but rather, if a player was in an unfavourable position and was hit hard enough, he may have sustained a concussion despite his helmet (6, 7, 15). Alley's study (6) estimated that of the boys receiving head injuries, only 4.7 per cent were wearing properly fitted helmets.

Dickinson and Shramel (17) found that the extent of college playing experience had no apparent relationship to either frequency or degree of severity of cerebral concussion. Determining the mass which caused these injuries, the authors found that a blow from the opponent's knee and the opponent's helmet accounted for 36 per cent and 25 per cent of all concussions, respectively. Contact with the turf resulted in 25 per cent of all concussions while contact with the opponents foot and the opponent's shoulder each resulted in over 14 per cent of all concussions.

Of the offensive personnel, running backs sustained 60 per cent of the injuries to the offensive personnel, almost a two to one ratio over

other positions. Of these, 50 per cent were sustained while blocking, and 50 per cent while carrying the ball. Of the injured defensive personnel, interior linemen and defensive ends incurred an injury rate of 84 per cent. Also, of all injured defensive personnel, 67 per cent received injury while tackling. Defensive backs incurred few head injuries. The majority of head injuries were received during the second and third periods of games and practices. The kick-off, a relatively brief component of football, resulted in 5 per cent of all concussions sustained in games (17).

Little organized research has been done in order to identify the causes of injuries to the lower extremities. Peterson (24) attributed the cross-body block as being the major source of knee injuries. In a study of 259 knee injuries incurred by football players since 1952 at the University of Michigan and Michigan State University and by Detroit Lions players, Peterson found that approximately 50 per cent of all serious knee injuries were the result of this type of block. The author suggested that this game manoeuver be evaluated or eliminated from the game completely.

The American Coaches Association (11) revealed that the major activities in football accounted for the greatest number of fatalities. Tackling represented 31 per cent, ball-carrying 16 per cent, and blocking 9 per cent of fatal injuries. Of the total number of football fatalities, 35 per cent occurred to the defensive personnel. It was also suggested that "spearing" be condemned from the game, since the most recent survey revealed that 100 per cent of direct fatalities resulted from injuries to the head and neck (12). This condemnation of "spearing" has been supported by others (6, 7, 9, 18, 19, 22).

Summary

The incidence of football injuries generally ranged from 10 per cent to 33 per cent, although an American air force study revealed a football injury rate of 62 per cent. Generally, minor-type injuries accounted for 70 per cent of all injuries. High-school football, comprising the majority of participants, accounted for the greatest injury number, followed by college football. For these levels combined, less than three participants per 100,000 became fatalities as the result of participation in football.

The majority of injuries were contusions, sprains and strains while fractures occurred less frequently. Abrasions and lacerations were found to be few. The lower extremities, such as the knee and ankle, were the body regions most often injured. Injuries to the shoulder and head followed, respectively. Facial and dental injuries as well as abdominal-internal injuries declined, while fatal head and spinal injuries increased in relation to fatalities involving injury to other body parts.

Blocking, tackling and ball-carrying contributed to the majority of direct injuries and fatalities. Specific causes of injuries have been attributed to "spearing" techniques, the lever action of the facebar, the inability of the helmet to reduce head injuries entirely, and "cross-body blocking."

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CHAPTER III

METHODS AND PROCEDURES

Methods

Injury Report Form. To investigate the incidence, nature and cause of football injuries in Edmonton, the survey technique was chosen. After examination of past studies and consultation with coaches, trainers, physicians and players, an injury report form was devised specifically for the study. This injury report form has been included in Appendix A.

An instructional pamphlet, also included in Appendix A, supplemented the report forms and served to introduce and explain proper completion and accurate reporting.

Nature of Sample. The sample consisted of 1549 players from thirty-eight teams representing the professional, intercollegiate, junior, high-school, and bantam levels. The intercollegiate, high-school and bantam levels represented both junior and senior teams.

Participation figures for each team were based on the number of players participating at the end of the first week of preseason practice. Final team rosters were also determined for all teams.

Procedures

Upon approval from the Edmonton Eskimo Professional Football Club, Edmonton High-School Athletic Council, Huskie Amateur Athletic Association, as well as the coaches, trainers and physicians of the various teams, the injury report forms were distributed to the coaches or trainers of the various teams. The nature and mechanism of trauma was often specifically

identified through interview with team physician, trainer or coach, or interview with the injured player.

Since the report forms could not be collected exclusively by the administrator, four volunteers aided in the collection of the forms. The volunteers, prior to the collection of the data, were instructed in the proper use of the form.

At the end of the season, data was transferred from the report forms to IBM eighty column hollerith cards. As indicated in Appendix C, the cards were subsequently run through the computer under conditions designed to yield incidence totals and possible causal relationships.

CHAPTER IV

RESULTS AND DISCUSSION

Results were tabulated and analyzed by combining the five levels of football used in the study. Items have been discussed basically in accordance to their position on the injury report form. Only those items from which meaningful results and comparisons could be found from the injury report form were included in the present chapter.

Incidence

During the 1969 football season some 1549 participants were studied. Of this total, 571 were reported injured, which indicated an injury rate of 36.9 per cent. Table VII represents a summary of the findings.

TABLE VII
Football Injuries 1969

Level	No. of Teams	No. of Participants	No. of Injuries
Professional	1	59	65
Intercollegiate	2	70	69
Junior	2	100*	121
High-School	30	1200*	275
Bantam	3	120*	41
Totals	38	1549	571

* Based on estimates from coaches.

Varsity and junior varsity statistics were combined. Thirty teams were used in the compilation of the data for the high school level. The

data for the two junior teams were pooled, as were the data for the three bantam teams.

Age

Table VIII reflects the number of people in each age group that sustained football injuries. Of all injuries, 85.9 per cent were to the twenty-one and under group.

TABLE VIII
Age Related to Incidence of Injury

Age Group	Profes- sional	Inter- collegiate	Junior	High School	Bantam	Total	Percentage of Total
Under 10	--	--	--	--	--	--	--
10-11	--	--	--	--	--	--	--
12-13	--	--	--	--	9	9	1.6
14-15	--	--	--	55	32	87	15.2
16-17	--	3	15	177	--	195	34.1
18-19	--	18	58	43	--	119	20.8
20-21	3	30	48	--	--	81	14.2
22-23	30	10	--	--	--	40	7.0
24-25	13	8	--	--	--	21	3.5
26-27	8	--	--	--	--	8	1.4
28-29	10	--	--	--	--	10	1.8
30 and over	1	--	--	--	--	1	0.4
Totals	65	69	121	275	41	571	100.0

No injuries were recorded in the eleven and under age groups. There were a variety of injuries in each age group and the injuries were distributed over the body. The knee and ankle sprains were the most common injuries found in most age groups except to the twelve to thirteen,

twenty-six to twenty-seven, and thirty and over age groups. Sprains to the knee and ankle ranged from 13.8 per cent in the fourteen to fifteen age group to 30 per cent in the twenty-eight to twenty-nine age group.

Bruises to the jaw, finger, thigh, knee, calf, shin and ankle represented 88.9 per cent of the total injuries in the twelve to thirteen age group. In the fourteen to fifteen age group, 8.1 per cent of the injuries were fractures to fingers and ankles. Bruises to the thigh and lower back accounted for 9.2 per cent. Dislocated or separated shoulders and fingers resulted in 7.2 per cent of the injuries in the sixteen to seventeen age group, while strains to the knee, ankle and neck accounted for 6.7 per cent. Bruises to the chest and thigh represented 7.6 per cent in the eighteen to nineteen age group while bruises to the knee and thigh contributed to 8.6 per cent in the twenty to twenty-one age group. Strains to the shoulder and groin resulted in 12.5 per cent of the injuries in the twenty-two to twenty-three age group, followed by bruised thighs at 10.0 per cent and concussions at 5.0 per cent. Concussions and groin strains each contributed 9.5 per cent of the injuries in the twenty-four to twenty-five age group. In the twenty-six to twenty-seven age group, hip and thigh bruises accounted for 37.5 per cent. Strains to the lower back, calf and groin also accounted for 37.5 per cent of the injuries in this age group. Bruises to the lower back and thigh accounted for 20.0 per cent in the twenty-eight to twenty-nine age group, while concussions and separated-dislocated wrists each accounted for 10 per cent of the injuries.

Previous Football Experience

Participants with three to five years of football experience sustained the greatest number of injuries. Over 27 per cent of all in-

juries occurred to this group. Injuries occurring in the remaining groups were approximately evenly distributed, ranging from 14.4 per cent for first year participants to approximately 17.0 per cent for the remaining groups.

Position Playing When Injured

Table IX reveals the incidence of injuries according to position.

TABLE IX

Position Related to Incidence of Injury

Position	Profes- sional	Inter- collegiate	Junior	High School	Bantam	Total	Percentage of Total
fullback	5	2	11	13	5	36	6.3
offensive half	5	7	8	21	5	46	8.1
wingback	-	4	3	9	2	18	3.2
defensive half	13	21	19	28	7	88	15.4
guard	3	6	10	15	3	37	6.5
offensive tackle	4	3	8	15	1	31	5.4
defensive tackle	4	5	7	31	3	50	8.8
linebacker	6	7	18	39	3	73	12.8
offensive end	9	3	8	13	1	34	5.9
defensive end	5	6	9	31	-	51	8.9
flanker	1	2	2	11	-	16	2.8
centre	3	1	1	16	1	22	3.8
quarterback	3	2	3	8	4	20	3.5
punter or kicker	-	-	-	1	1	2	0.4
other	4	-	14	24	5	47	8.2
Totals	65	69	121	275	41	571	100.0

Offensive personnel sustained 45.8 per cent of the total number of injuries, while defensive personnel sustained 45.9 per cent. The "other"

category, consisting mainly of specialty personnel, received the remaining 8.3 per cent of injuries. Of the offensive personnel, 29.4 per cent received injury while executing blocks, 20.2 per cent while being tackled and 12.2 per cent while receiving passes. Players tackling received 56.9 per cent of the injuries to the defensive personnel, while players being blocked sustained 18.3 per cent of the injuries.

Of the injuries that occurred to the defensive backs, 23.9 per cent were knee and ankle sprains, while another 10.0 per cent were cerebral concussions. Bruises to the foot, lower back, calf and thigh accounted for a total of 11.4 per cent as did strains to the neck, hamstring, thigh and shin combined. Of the more serious injuries, one hairline fracture to the cervical vertebra, two fractured ankles, and two internal injuries to the genitals were reported.

Knee and ankle sprains accounted for 17.9 per cent of the injuries to the linebackers. Strains to the neck, lower back, shoulder, and groin together accounted for 15.1 per cent, slightly more than the 13.7 per cent figure for bruises to the thigh, chest, shin, and foot. One fractured hand, two fractured fingers, and one fractured ankle also occurred to the linebackers.

Injuries to the defensive ends consisted of 25.5 per cent knee and ankle sprains, 21.6 per cent fractured noses, ankles, and feet. Bruised ribs, fingers, and thighs accounted for another 15.7 per cent. Knee and ankle sprains accounted for 20.0 per cent of the injuries to the defensive tackles, while another 20.0 per cent were bruises to the lower back, chest, hand, knee, shin, foot, shoulder and ankle. Fractured hands, elbows, lower arms and thumbs totalled 12.0 per cent. Five separated shoulders were also noted. The other category, representing mainly punt

and kick-off return specialists, accounted for 17.0 per cent of the knee and ankle sprains and 10.6 per cent concussions. Bruises to the hip, lower back, abdomen, and thigh totalled 19.2 per cent while three neck muscle or ligament strains were also found.

Offensive halfbacks incurred 19.6 per cent knee and ankle sprains while fractures to the nose, wrist, hand, thumb, fingers and ankles totalled 15.2 per cent. Another 10.1 per cent were knee and shoulder bruises while 6.5 per cent were classified as concussions.

Knee and ankle sprains totalled 21.6 per cent for the guards. Strains represented 27.0 per cent and concussions 10.8 per cent.

Injuries to fullbacks accounted for 22.2 per cent of the total number of knee and ankle sprains, while strains to the groin, finger and lower back totalled 16.7 per cent of the injuries. Fractures to the upper extremities accounted for 19.4 per cent. No concussions to the fullbacks were reported. Injuries to the offensive tackles were mainly strains to the neck, hamstring, hip, groin, ankle and foot. When pooled, these strains accounted for 32.3 per cent of the total injuries to the offensive tackles. Knee and ankle sprains totalled 16.1 per cent followed by bone, joint and muscle bruises at 29.0 per cent.

Of injuries to centres, 27.3 per cent were knee and ankle sprains, while concussions, shoulder strains, and finger lacerations each represented 9.1 per cent. Injuries to quarterbacks were found to be relatively mild, with 20.0 per cent as knee and ankle sprains, and 25.0 per cent as shoulder, groin, thigh and knee strains.

Knee and ankle sprains represented 33.3 per cent of the injuries to wingbacks, while dislocated knees and fingers totalled 16.7 per cent. Only one mild concussion was reported to players of this position. Flankers

received 31.1 per cent sprains while dislocated shoulders and fingers along with strained knees and ankles, each totalled 18.8 per cent. One fractured thumb and concussion were also reported for this position. A neck and a groin strain were the only injuries that occurred to the punters or kickers.

League

The incidence of injury related to the various levels of football has been previously shown in Table VII. Since more than one team has been represented in several of the totals, a percentage comparison between these levels was not considered relevant. However, a description as to the nature of injuries for each level has been presented in Tables X and XI.

At the professional level, muscle strains were the most common injuries and represented 27.6 per cent of the total injuries, followed by ligament sprains at 21.5 per cent and muscle bruises at 16.9 per cent. Strains to the lower back, hamstring, calf, shoulder and groin totalled 21.5 per cent while knee and ankle sprains totalled 16.9 per cent. Muscle bruises to the lower back, abdomen, and thigh totalled 15.4 per cent. There were five concussions which accounted for 7.7 per cent of the total injuries.

Knee and ankle injuries were 42.0 per cent of all injuries sustained at the intercollegiate level. Of these, 30.4 per cent were knee and ankle sprains. Strains to the neck, lower back, shoulder, groin and knee totalled 14.5 per cent while another 13.0 per cent were hand, knee and foot bruises. Two fractured hands, one fractured nose, and one minor concussion were the most serious injuries recorded for this level.

At the junior level, 25.6 per cent of the injuries were knee and ankle sprains, while 20.0 per cent were strains. Fractures and muscle

bruises each represented 9.9 per cent, while concussions accounted for another 4.1 per cent. A fracture of the cervical vertebra, which forced the player to be restricted from football indefinitely, accounted for the most serious injury at the junior level.

Although two categories existed in each of the high school and bantam levels, results have been reported as a combination of the junior and senior levels. Injuries to the knee and ankle were the most common injuries at the high school level, and accounted for 34.2 per cent of the total injuries. Sprains to the knee and ankle represented 20.7 per cent. Neck, lower back, chest, groin, knee and ankle strains accounted for 12.7 per cent, while fractures to the nose, hand, thumb, finger and ankle accounted for another 10.5 per cent. Bruises to the shoulder, chest, hip, finger, shin, and foot accounted for 7.7 per cent. Concussions were found to represent 5.8 per cent. A fractured cervical vertebra and a bruised kidney were the most serious injuries recorded for this level. The nature of injuries were found to be similar for both levels of high school football.

At the bantam level, muscle bruises accounted for 31.7 per cent of all injuries at this level. Muscle bruises to the lower back and thigh accounted for 19.5 per cent. Strains to the neck and groin totalled 12.2 per cent, the same percentage as for the total joint bruises. A fractured ankle and a fractured collarbone represented the most serious injuries found, and occurred with the juvenile bantams. Juvenile bantams also incurred the only knee sprain recorded for the bantam level. No concussions were found at this level.

Body Regions Injured

Table X provides a summary of the body regions injured. Discussion of these regions is presented throughout the chapter.

Types of Injury

The various types of football injuries incurred are shown in Table XI. No deaths directly due to football were recorded, however one death did occur during a pre-game warm-up. A case-study of the fatality has been presented in Appendix D. The 457 players injured received 571 injuries, indicating that approximately 20.0 per cent incurred multiple injuries.

Sprains. Ligament sprains accounted for 25.2 per cent of the total injuries. Of these ligament sprains, 43.1 per cent were to the knee and 40.9 per cent were to the ankle. Knee and ankle sprains combined to represent 84.0 per cent of all sprains and 21.2 per cent of total injuries. Invariably, knee sprains involved the medial collateral ligament and many were treated by use of cylindrical casts. Ten players required surgical correction to the knee. In the ankle region, the lateral ankle ligaments were the most frequently pulled. Shoulder sprains contributed to 6.3 per cent of all sprains, while thumb sprains contributed to 3.3 per cent and wrist sprains to 2.1 per cent. The remaining 4.3 per cent were upper and lower back, elbow, finger and foot sprains.

Strains. Injuries classified as involving the musculotendinous unit accounted for 19.3 per cent of the total injuries. Of these musculotendinous injuries, neck strains represented 16.3 per cent of all strains while strains to the groin were 15.5 per cent. Lower back strains accounted for 12.7 per cent, followed by shoulder strains at 11.8 per cent. Strains to the knee and ankle totalled 15.5 per cent.

TABLE X

Body Region Related to Incidence of Injury

Body Region Injured	Profes- sional	Inter- collegiate	Junior	High School	Bantam	Total	Percentage of Total
Head	5	1	6	16	-	28	4.9
Neck	-	3	8	9	3	23	4.0
Upper back	-	1	1	1	-	3	0.5
Elbow	-	1	3	2	2	8	1.4
Lower back	5	2	5	12	5	29	5.1
Hamstring	2	-	1	1	1	5	0.9
Calf	2	1	1	2	1	7	1.2
Achilles	-	-	1	-	-	1	0.2
Heel	1	2	-	3	-	6	1.1
Sole	1	1	-	-	-	2	0.4
Forehead	-	-	1	-	-	1	0.2
Eye	3	1	-	2	-	6	1.1
Nose	2	1	1	12	1	17	3.0
Mouth	-	2	1	3	-	6	1.1
Jaw	-	1	1	2	2	6	1.1
Throat	-	-	-	-	1	1	0.2
Shoulder	5	4	9	21	-	39	6.8
Chest	1	-	2	8	-	11	1.9
Upper arm	1	-	1	2	-	4	0.7
Lower arm	-	-	3	4	-	7	1.2
Abdomen	1	1	1	2	2	7	1.2
Hip	1	-	2	3	1	7	1.2
Wrist	2	-	2	3	-	7	1.2
Hand	1	6	2	8	1	18	3.2
Genital	-	1	1	-	-	2	0.4
Thumb	-	1	4	12	-	17	2.9
Finger	-	2	5	26	4	37	6.5
Groin	4	2	4	5	2	17	2.9
Thigh	9	2	8	3	4	26	4.6
Knee	9	15	25	45	5	99	17.3
Shin	-	1	3	5	2	11	1.9
Ankle	7	14	14	49	3	87	15.2
Foot	1	3	4	11	-	19	3.3
Toe	2	-	1	1	-	4	0.7
Other	-	-	-	2	1	3	0.5
Totals	65	69	121	275	41	571	100.0

TABLE XI

Type of Injury Related to Incidence of Injury

Type of Injury	Professional	Inter-collegiate	Junior	High School	Bantam	Total	Percentage of Total
Abrasion	--	--	1	7	1	9	1.6
Bone Bruise	6	9	7	28	6	56	9.8
Concussion	5	1	5	16	--	27	4.7
Dislocation/ separation	1	2	6	21	2	32	5.6
Fracture	4	3	12	38	2	59	10.3
Joint Bruise	2	1	6	10	7	26	4.6
Laceration/ incision/ puncture	4	4	2	10	1	21	3.7
Muscle bruise	11	5	12	15	13	56	9.8
Muscle/tendon strain	18	14	24	47	7	110	19.3
Nosebleed	--	--	--	2	1	3	0.5
Ligament sprain	14	24	38	67	1	144	25.2
Injury to internal organs	-	1	1	1	--	3	0.5
Blisters	--	2	--	2	--	4	0.7
Teeth	--	2	1	3	--	6	1.1
Other	--	1	6	8	--	15	2.6
Totals	65	69	121	275	41	571	100.0

Fractures. Fractures accounted for 10.3 per cent of the total number of injuries. Of the total number of fractures, 15.2 per cent were to the hand, 13.6 per cent to the ankle, thumb and finger combined, and 11.9 per cent to the nose. A crushed cervical vertebra and a hairline fracture of the sixth cervical vertebra, represented the most serious of the fractures. Although the player with the crushed disc was not allowed to participate in football again, the other player continued to play during the rest of the season following a few weeks recuperation.

Muscle, Bone and Joint Bruises. Muscle, bone and joint bruises accounted for 24.2 per cent of all injuries. Total bone and muscle bruises each represented 9.8 per cent of the total injuries. Muscle bruises to the thigh accounted for 35.7 per cent of all injuries while lower back bruises accounted for 17.9 per cent. Bone bruises to the chest accounted for 17.9 per cent of this type of injury. Bruises to the foot accounted for 16.1 per cent while "hip pointers" accounted for 10.7 per cent. Shin and hand bruises each accounted for 8.9 per cent of all bone bruises. Ankle bruises accounted for 34.6 per cent of all bruises to the joint, while bruises to the knee accounted for another 26.9 per cent.

Dislocations and Separations. Dislocations and separations represented 5.6 per cent of all injuries. Of this total number of dislocations and separations, 37.5 per cent were to the finger, 21.9 per cent to the shoulder and another 15.6 per cent to the knee. Two neck and one lower back sprain injury were also recorded. However, only one neck injury was serious enough to restrict a player from football indefinitely. A congenital cervical defect was diagnosed as the cause which subsequently resulted in the individual being excluded from playing football.

Concussions, Internal Injuries and Blisters. Concussions represented 4.7 per cent of all injuries, several of which were to the same individual. Three players suffered internal organ injuries. Two of these players received injuries to the genital region which resulted in severe swelling and discolouration to this body region. Both players returned to competition several weeks later. The third internal injury was to the kidney, in which slight hematuria was evidenced. This individual also returned to play following a few weeks rest. Although blisters were found to be relatively common in football, the small figure represented only those blisters that kept players from play as was noted in the injury definition as used in the study.

Causes of Injury

The causes of football injuries as stated by those who were injured are presented in Table XII. Results indicated that the basic elements of the game which required contact on the part of the players resulted in the majority of injuries. Collision between players contributed to 96.3 per cent of all concussions, 92.9 per cent of all muscle bruises, 86.5 per cent of the fractures and 86.1 per cent of the total number of bone bruises. It was found that 79.9 per cent of the ligament strains were the result of collision between players, while the three internal organ injuries also resulted from collisions. Falls or trips contributed to 26.9 per cent of all joint bruises and 18.18 per cent of the dislocations-separations. One player was restricted from football or contact sports following a fall to the ground and injury to the back of his neck. Of the dislocations-separations, 12.5 per cent were the result of collision with objects. Most of the dislocations-separations occurred to

the thumb and fingers as a direct result of contact with the football.

TABLE XII

Cause of Injury Related to Incidence of Injury

Cause of Injury	Profes- sional	Inter- collegiate	Junior	High School	Bantam	Total	Percentage of Total
Collision with objects	--	2	6	12	1	21	3.7
Collision with persons	42	51	85	211	34	423	74.1
Faulty equip- ment/apparatus	2	1	5	3	--	11	1.9
Fall or trip	6	10	16	35	5	72	12.6
Other	15	5	9	14	1	44	7.7
Totals	65	69	121	275	41	571	100.0

Injuries Occurring During Penalties

No penalties were assessed on 98.2 per cent of all injuries. Penalties were issued to the non-injured players on nine occasions while only one player who was injured was penalized. All of these injuries were of a minor nature, representing mainly sprains and bruises. Infractions called were either for roughing or blocking from the rear penalites.

Protective Strapping

Of those injured, 86.2 per cent had no support/dressing previous to the injury, while 6.12 per cent had some form of taping for support. Elastic bandages and wraps were used by 5.8 per cent of those injured. Sprains

to the knee which had elastic bandages or tape for support represented 8.1 per cent. Over 32.0 per cent of all ankle injuries occurred to ankles that were wrapped or taped. Fractured ankles also were incurred by three of these individuals.

Game and Practice Periods

As shown in Table XIII the majority of injuries occurred in practices and games, for a combination of 86.9 per cent. The remaining 13.1 per cent of injuries occurred during pre-practice, warm-up and scrimmage sessions. Games contributed to 52.1 per cent of all sprains, while another 37.5 per cent occurred in practices. Of all strains, 55.5 per cent occurred in the practices while 36.4 per cent occurred in games. Games resulted in 62.5 per cent of all muscle bruises. Joint bruises were 46.2 per cent as the result of practices and 38.5 per cent as the result of games. Of the total number of fractures, 45.8 per cent occurred in games, 40.0 per cent in squad scrimmages and 14.2 per cent in regular practices. Dislocations-separations were 46.9 per cent as the result of games and 40.6 per cent as the result of practices. Of the total number of concussions, 62.9 per cent occurred in games, while 22.2 per cent occurred in practices and 14.8 per cent in squad scrimmages. Of the more serious injuries, two internal organ injuries occurred in games while one occurred in practice. At the high school level, one death did occur during a pre-game warm-up, however the death was not attributed directly to football but rather to a congenital heart condition. Sprains and strains were the most common injuries in the pre-game warm-ups and pre-practice sessions.

TABLE XIII

General Activity Related to Incidence of Injury

Occurred During	Professional	Inter-collegiate	Junior	High School	Bantam	Total	Percentage of Total
Prepractice	--	--	--	3	1	4	0.7
Warm-up	2	1	1	1	3	8	1.4
Regular practice	22	43	47	105	7	224	39.2
Squad scrimmage	9	4	5	40	5	63	11.0
Regular game	32	21	68	126	25	272	47.7
Totals	65	69	121	275	41	571	100.0

Specific Activity During Injury

Table XIV shows that the major components of the game incurred the majority of the injuries. Blocking and tackling produced 49.4 per cent of the injuries while those players who were blocked and tackled contributed to 23.8 per cent of the injuries. Tackling produced 27.1 per cent of all sprains, 34.6 per cent of all strains, and 55.4 per cent of all bone bruises. Fractures accounted for 32.2 per cent of the injuries occurring to tacklers while concussions totalled 59.3 per cent. Tackling also resulted in 21.4 per cent of all muscle bruises and 25.0 per cent of all dislocations-separations. One minor genital injury occurred to a tackler.

Blocking contributed to 13.9 per cent of the sprains and 16.4 per cent of the muscle strains. The same activity also resulted in 23.2 per cent of the muscle bruises and 22.1 per cent of the fractures. Three mild

concussions and one injury to the genitals also resulted from blocking.

TABLE XIV
Specific Activity Related to Incidence of Injury

Specific Activity	Professional	Inter-collegiate	Junior	High School	Bantam	Total	Percentage of Total
Tackling	13	25	26	113	12	189	33.1
Tackled	10	6	22	27	7	72	12.6
Carrying the ball	--	3	6	22	7	38	6.7
Blocking	11	6	26	46	4	93	16.4
Blocked	8	10	18	22	6	64	11.2
Catching a pass	6	7	5	18	--	36	6.3
Covering a pass	5	5	1	6	--	17	2.9
Throwing a pass	2	--	--	--	--	2	0.4
Punting or kicking	--	--	--	2	1	3	0.5
Other	10	7	17	19	4	57	9.9
Totals	65	69	121	275	41	571	100.0

Players who were tackled received 18.1 per cent of the ligament sprains and 23.2 per cent of all muscle bruises. Tackled players also received 20.3 per cent of all fractures. In addition, concussions were received by two players during play in which they were tackled.

Players who were blocked on the play which resulted in an injury incurred 18.1 per cent of all sprains and 19.6 per cent of all muscle bruises.

Three concussions and one mild bruised kidney represented the most serious injuries that occurred during this activity.

Distance into Season

As Table XV indicates, pre-season activity and that activity less than one-quarter through the season resulted in the majority of injuries, accounting for almost 60.0 per cent of all injuries.

TABLE XV

Distance into Season Related to Incidence of Injury

Team Season	Professional	Inter-collegiate	Junior	High School	Bantam	Total	Percentage of Total
Pre-season	45	43	48	78	8	222	39.0
Less than 1/4	6	18	35	54	7	120	21.0
1/4 to 1/2	4	7	8	50	5	74	12.9
1/2 to 3/4	5	--	10	51	8	74	12.9
3/4 to end	5	1	9	31	2	48	8.4
Playoffs	--	--	11	11	11	33	5.8
Totals	65	69	121	275	41	571	100.0

Ligament sprains decreased as the season progressed, from the pre-season figure of 39.6 per cent to the 4.2 per cent figure for play-offs. Similarly, strains decreased from 43.6 per cent during the pre-season period to 3.6 per cent during the play-offs. Fractures represented 32.2 per cent of the total number of injuries during the pre-season period and remained around 13.6 per cent throughout the remainder of the season. A distribution of the types of injuries recorded has been presented in Table XI.

Time of Practice or Game

Table XVI shows the distribution of injuries at different times during practices and games.

TABLE XVI

Time of Practice or Game Related to Incidence of Injury

Time of Practice or Game	Professional	Inter-collegiate	Junior	High School	Bantam	Total	Percentage of Total
First 1/2 of practice	18	19	21	57	7	122	21.4
Second 1/2 of practice	15	26	32	82	9	164	28.7
Pre-game warm-up	--	1	1	2	--	4	0.7
First quarter	3	5	16	25	1	50	8.8
Second quarter	10	4	13	39	2	68	11.9
Third quarter	9	6	18	47	11	91	15.9
Fourth quarter	10	8	20	23	11	72	12.6
Totals	65	69	121	275	41	571	100.0

The percentage of muscle strains was identical for both halves of practices. However, sprains, bruises, fractures and concussions were found to occur more frequently in the second half of practice. During the pre-game activity, only one joint bruise, muscle strain and ligament sprain was recorded. The lone fatality also occurred during this period.

Sprains and strains were more frequent during the third quarter of games, while muscle and bone bruises were more frequent during the third and fourth quarters. Fractures were found to be relatively similar in percentage over the four quarters of a football game. Concussions were more frequent in the second and fourth quarters, while dislocations-

separations were more frequent in the third quarter.

Type of Facemask

As indicated in Table XVII, the majority of those injured wore double-bar facemasks. It must be noted that the majority of players wore double-bar facemasks. Cage-type facemasks were more numerous than single-bar facemasks.

TABLE XVII

Type of Facemask Related to Incidence of Injury

Type of Facemask	Professional	Inter-collegiate	Junior	High School	Bantam	Total	Percentage of Total
Single-bar	5	1	6	8	8	28	4.9
Double-bar	32	47	61	173	31	344	60.2
Cage-type	28	21	54	94	2	199	34.9
Totals	65	69	121	275	41	571	100.0

No neck injuries were recorded to players using single-bar facemasks, while those players with double-bar facemasks accounted for 60.9 per cent of the neck injuries and those with cage-type facemasks accounted for another 39.1 per cent. Several players from the high school and bantam teams, representing fullbacks, defensive tackles, and defensive ends, made use of the single-bar facemask.

No mouth and nose injuries occurred to players wearing single-bar facemasks, however players wearing double-bar facemasks incurred 70.6 per cent of all nose injuries. All mouth injuries occurred to players who wore double-bar facemasks. Of all jaw injuries, 66.7 per cent were to players wearing cage-type facemasks. The remaining jaw injuries were distributed

evenly between those players with single and double-bar facemasks. Two fullbacks and one linebacker using a double-bar facemask received broken cheekbones.

Type of Footwear

Table XVIII reveals that the majority of those injured wore some form of low-cut footwear. With the exception of the bantam level, where running shoes were mandatory, the majority of players were wearing cleats at the time of injury.

TABLE XVIII

Type of Footwear Related to Incidence of Injury

Footwear	Profes- sional	Inter- collegiate	Junior	High School	Bantam	Total	Percentage of Total
High-cut runners	--	--	--	3	3	6	1.1
Low-cut runners	--	--	1	12	37	50	8.8
High-cut cleats	--	6	2	22	--	30	5.2
Low-cut cleats	65	63	118	236	1	483	84.5
Other	--	--	--	2	--	2	0.4
Totals	65	69	121	275	41	571	100.0

Knee injuries, mainly sprains and strains, were incurred by 90.9 per cent of those players wearing low-cut cleats. Those players wearing low-cut running shoes incurred 5.1 per cent knee injuries while those in high-cut cleats incurred 4.0 per cent. No knee injuries were recorded to those players who wore high-cut running shoes.

Only one ankle sprain occurred to players wearing high-cut running shoes. Players wearing low-cut cleats incurred 88.5 per cent of the

ankle injuries, the majority of which were sprains. Those with low-cut running shoes received 5.7 per cent ankle injuries, one of which was a fractured ankle. The remaining 4.6 per cent of ankle injuries were incurred by those players wearing high-cut cleats.

It must be noted that although the majority of those players that sustained injuries to the knee or ankle wore low-cut footwear, the greater number of participants wore this type of footwear.

Additional Results and Comparisons

Of all players injured, 18.3 per cent incurred a similar previous injury. Of these injuries, 34.3 per cent were sprains mainly to the knee, ankle and shoulder, while 24.8 per cent were strains to the neck and lower back. The most serious of the recurring injuries were dislocations and separations of fingers and shoulders which accounted for 6.7 per cent of all recurring injuries. Fractures represented 5.7 per cent.

In 68.3 per cent of the injuries a doctor was not in attendance. Immediate medical attention was not available for 83.1 per cent of the fractures, 65.6 per cent of the dislocations and separations and 55.6 per cent of all concussions. During practices a doctor was not present for 90.6 per cent of the injuries nor was one present at squad scrimmages where 85.7 per cent of the injuries occurred. Also, of 45.6 per cent of those injured in games no doctor was in attendance.

At the time of injury, some form of assistance from a trainer was available for 89.7 per cent of the injuries. Several teams, especially at the high school level, made use of "student trainers." First-aid supplies were available for 93.5 per cent of the injuries, however as noted by several coaches and trainers, the supplies were limited mainly to the treatment of minor injuries.

Discussion

The results presented did not represent the entire football population within Edmonton. Furthermore, because of the turnover of players early in the season, it was difficult to determine the actual number of participants studied. The injury rate was relatively higher than that found in the literature, since previous studies generally considered only the more serious football injuries.

Players injured ranged in ages from twelve to over thirty years. In fact, 85.9 per cent of all injuries were incurred by the twenty-one and under age group, indicating a need for safety instruction in football for this group. Over 27.0 per cent of the injuries occurred to those players with three to five years of football experience (relatively more than the first and second year participants). The percentage of injuries incurred by the more experienced group may be the result of other factors such as the more skilled the player, the greater the contact this player would be able to initiate.

Since defensive backs (followed by linebackers, defensive ends and tackles) incurred more injuries than those playing at other positions, there appears to be a need for an evaluation of the selection of personnel and coaching techniques for this position. Cerebral concussions to the defensive backs represented 10.0 per cent of the injuries while a hair-line fracture of the cervical vertebra along with two genital injuries were the most serious injuries to players at this position. Emphasis on proper tackling techniques may have reduced the number of concussions occurring to the defensive backs.

The fact that the majority of participants as well as the number of injuries occurred at the high school level indicates a need for an empha-

sis on pre-season conditioning and injury prevention at this level before and during the football season.

Early in the season coaches should emphasize joint conditioning in an effort to minimize the number of ligamentous and musculotendinous unit injuries sustained to the knee, ankle and shoulder. Since bone, joint and muscle bruises totalled 24.2 per cent and fractures 10.3 per cent and did not fluctuate throughout the football season, there appears a need for a thorough evaluation of the equipment worn as well as an evaluation of the nature of the blows inflicted and their effects.

Collision between players contributed to 74.1 per cent of the injuries. The major components of the game such as blocking and tackling must be emphasized and properly instructed early in the season. Since players who were blocked and tackled represented 23.8 per cent of those injured, better techniques for receiving this contact should be taught. Knowledge on how to ready oneself for a hit or fall may aid in reducing the incidence of injury.

Although the possibility of injury was greater for practices than games, more injuries occurred in games. Also, the fact that serious injuries such as 62.9 per cent concussions occurred during games suggests an emphasis on injury prevention during this period. Readyng oneself for contact through the pre-game warm-up may help to reduce injuries.

The double-bar facemask appears to be inadequate in protecting the nose and mouth regions. It was noted that several players whose position required them to expose themselves to head and face contact wore only double or single-bar facemasks. Facemasks which provide greater protection to these areas should be worn.

The actual ratio of players wearing low-cut to those wearing high-cut footwear was not determined. However, the majority of those incurring injuries to the knee and ankle wore low-cut footwear indicating a need for continuous evaluation on the use and effectiveness of this type of footwear.

Since a doctor was not in attendance for 68.3 per cent of all injuries (which included 83.1 per cent of the fractures, 65.6 per cent of the dislocations-separations and 55.6 per cent of the concussions), a need for some trained personnel to care for such injuries is apparent. It was observed that several high schools made use of student-trainers for such a purpose.

CHAPTER V

SUMMARY AND CONCLUSIONS

Purpose

The purpose of the study was to determine the incidence of football injuries in the City of Edmonton and examine the nature and possible causes of all recorded accidents in order that tentative suggestions and recommendations could be made and directed at reducing the incidence of injury in subsequent years.

The study also served to further test the feasibility of applying computerized data processing methods to the analysis of athletic injuries.

Subjects

The persons surveyed were players from thirty-eight football teams representing the professional, intercollegiate, junior, high school, and bantam levels. The survey was conducted during the 1969-70 football season. Subjects surveyed were those players who missed part of a practice or game, who received medical treatment, or who were restricted from practice due to an injury. From a population of 1549 participants, 571 injuries were recorded.

Procedures

An accident report form was designed specifically for the study (Appendix A) and was supplemented by an instructional booklet for completing the form (Appendix B). Coaches, trainers and physicians completed the forms. The nature and mechanism of trauma was often specifically identified through interview with team physician, trainer or coach, or

interview with the injured player. Four volunteers, who were instructed in the proper use of the form, aided in the collection of the forms.

At the end of the season, data was transferred from the report forms to IBM eighty column hollerith cards (Appendix C).

Results

The overall rate of injury was 36.9 per cent. The injury rate was higher at the start of the season and decreased as the season progressed. Defensive halfbacks, followed by linebackers, defensive ends and tackles respectively, received more injuries than players of other positions. However, in considering total offensive and defensive personnel, each sustained a similar percentage of injuries. Knee and ankle sprains were the most common injuries.

Players twenty-one years of age and younger accounted for 85.9 per cent of those injured. The majority of players fell within this age group. Four hundred and fifty-seven players received 571 injuries, indicating that approximately 20.0 per cent of the players received more than one injury during the season. The major injuries by percentage were: sprains 25.2 per cent, bruises (bone, joint and muscle) 24.2 per cent, strains 19.3 per cent and fractures 10.3 per cent. Dislocations-separations represented 5.6 per cent while concussions were 4.7 per cent. Of the sprains, 43.1 per cent were to the knee and 40.9 per cent were to the ankle. Ten players required surgical correction to the knee. Knee sprains usually involved the medial collateral ligament while in the ankle region, the lateral ankle ligaments were most frequently injured.

Neck strains represented 16.3 per cent of all strains while groin strains accounted for another 15.5 per cent. A crushed cervical vertebra

to a high school player represented the most serious of the fractures. A lone fatality was recorded to a high school player during a pre-game warm-up, however the death was not attributed directly to football. Injuries occurred more frequently in games than practices. Of all concussions, 62.9 per cent occurred during games.

Collision between players accounted for 74.1 per cent of the injuries while falls and trips resulted in 12.6 per cent of the total. Those players executing blocks and tackles received 49.4 per cent of all injuries while those players receiving blocks and tackles sustained 23.8 per cent.

Pre-season activity and activities occurring in the first one-quarter of the season resulted in the majority of injuries, accounting for almost 60.0 per cent. Ligament sprains and muscle strains decreased as the season progressed. During the pre-season period fractures accounted for 32.2 per cent of all injuries. However, during the season, fractures accounted for 13.6 per cent of all injuries.

Bruises and more serious injuries such as fractures and concussions occurred more frequently in the second half of practice periods. Concussions were more frequent in the second and fourth quarters of games while dislocations-separations were more frequent in the third quarter of games. Fractures were relatively similar in frequency throughout the four quarters of games.

The double-bar facemask was used by 60.9 per cent of those players who received neck injuries, while another 39.1 per cent wore cage-type facemasks. Of the nose injuries, 70.6 per cent were to those players wearing double-bar facemasks while those wearing cage-type facemasks contributed 29.4 per cent. All mouth injuries were to those players who

were wearing double-bar facemasks.

The majority of those injured wore some form of low-cut footwear. Players wearing low-cut footwear sustained 90.9 per cent of the knee injuries and 88.5 per cent of the ankle injuries. Cleats were worn by players at all levels except at the bantam level, where running shoes were mandatory.

Over 18 per cent of the injured had incurred a similar previous injury. Of these, 34.3 per cent were mainly knee, ankle and shoulder sprains, while 24.8 per cent represented neck and lower back strains.

A doctor was not in attendance when 68.3 per cent of the injuries occurred; which included 83.1 per cent of the fractures, 65.6 per cent of the dislocations-separations, and 55.6 per cent of the concussions. In 45.6 per cent of the injuries occurring in games, no doctor was present. In the majority of instances first-aid assistance was provided by student trainers.

Conclusions

Within the limitations of this study, the following conclusions have been made:

1. The majority of injuries were in the high school. The majority of participants were also at this level.
2. Young persons (twenty and under) suffered the majority of injuries.
3. Defensive halfbacks received more injuries than those in any other position.
4. As indicated in previous studies, the knee and ankle were the body regions most frequently injured. The majority of these were sprains and strains. Bruises and fractures were not uncommon.
5. Collision between players and falls and trips resulted in the majority

of injuries. The majority of these occurred during games.

6. Those players who executed blocks and tackles incurred the majority of injuries, while those players who received blocks and tackles were also often injured.
7. The rate of injury was higher at the beginning of the football season.
8. Injuries occurred more frequently in the second half of practices than in the first half. More serious injuries were also more common during the second half of practices. The injury rate was relatively constant throughout the four quarters of the games.
9. Facial injuries were common to those players wearing cage-type facemasks as well as to those wearing double-bar facemasks.
10. Doctors were not present for the majority of injuries, which included the more serious injuries such as fractures, dislocations-separations, and concussions.

Recommendations

The results of this study revealed that a great number of injuries could be eliminated through the cooperation of the players, coaches, trainers, and medical profession.

1. Mandatory medical examinations and medical histories should be taken at the beginning of each season before allowing a player to participate in any football activity. This examination should take into account the various forces and stresses encountered in football.
2. All personnel concerned with training football athletes should emphasize proper, gradual and complete physical conditioning. Particular emphasis should be placed on joint (particularly the knee, ankle and shoulder) and neck strengthening exercises.

3. Gradual build up towards contact activity is recommended, especially early in the season. Practices should be designed so that techniques are mastered with a minimum of contact.
4. Since the majority of injured participants were in the twenty-one and under age group (mainly high school players), a need is indicated for injury prevention for this group before and throughout the football season. Although there is a regulation that prohibits any form of organized practice prior to a certain date, high school players should be encouraged to condition themselves well in advance of the oncoming football season.
5. Since the defensive backs incurred more injuries than any other position, a need exists for an evaluation of the selection of personnel and fundamental instruction for this position. Emphasis on proper tackling techniques may reduce the number of concussions occurring to the defensive backs.
6. There should be continued research concerning the safety factor in football (rules, facilities, equipment, etc.).
7. Since players who received blocks and tackles incurred injuries slightly less than those players who executed blocks and tackles, a need exists for some form of instruction on these game fundamentals. Knowledge on how to ready oneself for a hit or fall may help reduce the incidence of injury. On the other hand, it may be possible that the forces involved during these activities are greater than expected.
8. The double-bar facemask appears to be inadequate in protecting the nose and mouth regions.
9. The actual ratio of players wearing low-cut and high-cut footwear was not determined. However, the majority of those injured to the

knee and ankle wore low-cut footwear, indicating a continuous evaluation on the uses and effectiveness of this type of footwear.

10. Since over 18.0 per cent of those injured had incurred a similar previous injury, indicates that perhaps many of those who were injured were prematurely returned to activity.
11. Whenever possible a physician should be at the field of play during game and scrimmage practice sessions. When this is not possible, arrangements must be made in advance to obtain a physician's immediate service should an emergency arise.
12. Each institution should strive to have a team trainer who is adequately prepared and professionally qualified. It is recommended that some form of clinics be held for those persons interested in becoming student-trainers. Arrangements could be made involving the trainers from the university and professional football clubs.

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APPENDICES

APPENDIX A
FOOTBALL ACCIDENT REPORT FORM
1969-1970

FOOTBALL ACCIDENT REPORT FORM 1969-1970

The football accident report form consisted of thirty sections and 214 factors in addition to the small hand-written sections at the beginning and end of the form. Each of the additional points at the end of the form was considered as a section. The thirty sections were:

- | | |
|----------------------------------|------------------------------------|
| A. Age | N. Type of Sport |
| B. Height | O. Accident Occurred During |
| C. Weight | P. Specific Activity During Injury |
| D. Physical Fitness | Q. Facility Area |
| E. Participation in Other Sports | R. Time of Day |
| F. Football Skill Level | S. Distance into Team Season |
| G. Previous Football Experience | T. Time of Practice or Game |
| H. Position Playing When Injured | U. Temperature |
| I. League | V. Type of Field |
| J. Body Region Injured | W. Field Condition |
| K. Type of Injury | X. Type of Facemask |
| L. Cause of Injury | Y. Type of Footwear |
| M. Penalty on Play | Z. Additional Points |

Each section contained from two to thirty-six factors. The following depicts a sample of the form used in the study.

FOOTBALL ACCIDENT REPORT 1969-1970

CITY OF EDMONTON

Name of Player _____

Date _____

Address _____

Phone _____

Team _____

Field _____

INDICATE THE ONE OR MORE APPROPRIATE STATEMENTS FROM EACH OF THE FOLLOWING SECTIONS.

A. Age:

- | | | | |
|--------------------------------------|------------------------------------|------------------------------------|--|
| <input type="checkbox"/> 6. under 10 | <input type="checkbox"/> 9. 14-15 | <input type="checkbox"/> 12. 20-21 | <input type="checkbox"/> 15. 26-27 |
| <input type="checkbox"/> 7. 10-11 | <input type="checkbox"/> 10. 16-17 | <input type="checkbox"/> 13. 22-23 | <input type="checkbox"/> 16. 28-29 |
| <input type="checkbox"/> 8. 12-13 | <input type="checkbox"/> 11. 18-19 | <input type="checkbox"/> 14. 24-25 | <input type="checkbox"/> 17. 30 and over |

B. Height:

- | | | | |
|---|---|---|--|
| <input type="checkbox"/> 18. under 4'0" | <input type="checkbox"/> 20. 4'6"-4'11" | <input type="checkbox"/> 22. 5'6"-5'11" | <input type="checkbox"/> 24. 6'6" and over |
| <input type="checkbox"/> 19. 4'0"-4'5" | <input type="checkbox"/> 21. 5'0"-5'5" | <input type="checkbox"/> 23. 6'0"-6'5" | |

C. Weight:

- | | | | |
|---------------------------------------|--------------------------------------|--------------------------------------|---|
| <input type="checkbox"/> 25. under 70 | <input type="checkbox"/> 31. 120-129 | <input type="checkbox"/> 37. 180-189 | <input type="checkbox"/> 43. 240-249 |
| <input type="checkbox"/> 26. 70-79 | <input type="checkbox"/> 32. 130-139 | <input type="checkbox"/> 38. 190-199 | <input type="checkbox"/> 44. 250-259 |
| <input type="checkbox"/> 27. 80-89 | <input type="checkbox"/> 33. 140-149 | <input type="checkbox"/> 39. 200-209 | <input type="checkbox"/> 45. 260-269 |
| <input type="checkbox"/> 28. 90-99 | <input type="checkbox"/> 34. 150-159 | <input type="checkbox"/> 40. 210-219 | <input type="checkbox"/> 46. 270-279 |
| <input type="checkbox"/> 29. 100-109 | <input type="checkbox"/> 35. 160-169 | <input type="checkbox"/> 41. 220-229 | <input type="checkbox"/> 47. 280-289 |
| <input type="checkbox"/> 30. 110-119 | <input type="checkbox"/> 36. 170-179 | <input type="checkbox"/> 42. 230-239 | <input type="checkbox"/> 48. 290 and over |

D. Physical Fitness (player's condition relative to team average):

- | | |
|--------------------------------------|--------------------------------------|
| <input type="checkbox"/> 49. lower ½ | <input type="checkbox"/> 50. upper ½ |
|--------------------------------------|--------------------------------------|

E. Participation in Other Sports:

- | | |
|---|-------------------------------------|
| <input type="checkbox"/> 51. occasional | <input type="checkbox"/> 52. active |
|---|-------------------------------------|

F. Football Skill Level (player's skill relative to team average):

- | | |
|--------------------------------------|--------------------------------------|
| <input type="checkbox"/> 53. lower ½ | <input type="checkbox"/> 54. upper ½ |
|--------------------------------------|--------------------------------------|

G. Previous Football Experience:

- | | | |
|---|--|--|
| <input type="checkbox"/> 55. first year | <input type="checkbox"/> 57. 2 years | <input type="checkbox"/> 59. 6-10 years |
| <input type="checkbox"/> 56. 1 year | <input type="checkbox"/> 58. 3-5 years | <input type="checkbox"/> 60. 11 years plus |

H. Position Playing when Injured:

- | | | |
|---|---|---|
| <input type="checkbox"/> 61. fullback | <input type="checkbox"/> 66. offensive tackle | <input type="checkbox"/> 71. flanker |
| <input type="checkbox"/> 62. offensive half | <input type="checkbox"/> 67. defensive tackle | <input type="checkbox"/> 72. centre |
| <input type="checkbox"/> 63. wingback | <input type="checkbox"/> 68. linebacker | <input type="checkbox"/> 73. quarterback |
| <input type="checkbox"/> 64. defensive half | <input type="checkbox"/> 69. offensive end | <input type="checkbox"/> 74. punter or kicker |
| <input type="checkbox"/> 65. guard | <input type="checkbox"/> 70. defensive end | <input type="checkbox"/> 75. Other (specify) |

I. League:

- | | | |
|---|---|---|
| <input type="checkbox"/> 76. Junior Bantam | <input type="checkbox"/> 79. High School Senior | <input type="checkbox"/> 8. Intercollegiate |
| <input type="checkbox"/> 77. Juvenile Bantam | <input type="checkbox"/> 80. Junior | <input type="checkbox"/> 7. Professional |
| <input type="checkbox"/> 78. High School Junior | | |

J. Body Region(s) Injured

<p>REAR VIEW</p> <p><input type="checkbox"/> 8. head</p> <p><input type="checkbox"/> 9. neck</p> <p><input type="checkbox"/> 10. upper back</p> <p><input type="checkbox"/> 11. elbow</p> <p><input type="checkbox"/> 12. lower back</p> <p><input type="checkbox"/> 13. buttocks</p> <p><input type="checkbox"/> 14. hamstring</p> <p><input type="checkbox"/> 15. calf</p> <p><input type="checkbox"/> 16. Achilles</p> <p><input type="checkbox"/> 17. heel</p> <p><input type="checkbox"/> 18. sole</p> <p><input type="checkbox"/> 43. Other (specify)</p>	<p>FRONT VIEW</p> <p><input type="checkbox"/> 19. forehead</p> <p><input type="checkbox"/> 20. eye</p> <p><input type="checkbox"/> 21. nose</p> <p><input type="checkbox"/> 22. mouth</p> <p><input type="checkbox"/> 23. jaw</p> <p><input type="checkbox"/> 24. throat</p> <p><input type="checkbox"/> 25. shoulder</p> <p><input type="checkbox"/> 26. chest</p> <p><input type="checkbox"/> 27. upper arm</p> <p><input type="checkbox"/> 28. lower arm</p> <p><input type="checkbox"/> 29. abdomen</p> <p><input type="checkbox"/> 30. hip</p> <p><input type="checkbox"/> 31. wrist</p> <p><input type="checkbox"/> 32. hand</p> <p><input type="checkbox"/> 33. genital</p> <p><input type="checkbox"/> 34. thumb</p> <p><input type="checkbox"/> 35. finger</p> <p><input type="checkbox"/> 36. groin</p> <p><input type="checkbox"/> 37. thigh</p> <p><input type="checkbox"/> 38. knee</p> <p><input type="checkbox"/> 39. shin</p> <p><input type="checkbox"/> 40. ankle</p> <p><input type="checkbox"/> 41. foot</p> <p><input type="checkbox"/> 42. toe</p>
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K. Type(s) of Injury:

- ☐ 44. abrasion—removal of skin by mechanical means (scrape).
- ☐ 45. bone bruise—bruising of boney area (not a joint) due to a direct blow.
- ☐ 46. concussion—temporary loss of orientation or unconsciousness.
- ☐ 47. dislocation/separation—deformity of a joint with loss of function.

- () 48. fracture
 () 49. joint bruise—bruising of joint area due to direct blow
 () 50. laceration/incision/puncture—an open wound
 () 51. muscle bruise—swelling or discoloration of muscular area due to a direct blow.
 () 52. muscle/tendon strain—pull or tear of a muscle or tendon, due to use rather than direct blow.
 () 53. nosebleed.
 () 54. ligament sprain—twisting or moving of a joint (ligaments) beyond normal range.
 () 55. injury to internal organs (e.g. kidney, etc.).
 () 56. blisters.
 () 57. teeth—loosened or broken.
 () 58. other (specify)
- L. Cause(s) of Injury:
 () 59. collision with objects (e.g. bench, goal post, track, fence, etc.).
 () 60. collision with persons (e.g. players, officials, etc.).
 () 61. faulty equipment apparatus.
 () 62. fall or trip.
 () 63. other (explain)
- M. Penalty on Play:
 () 64. to injured player. () 66. no penalty.
 () 65. to another player.
 Specify Penalty
- N. If any, type of support/dressing used for injured area (previous to injury):
 () 67. elastic () 70. tape () 72. cast
 () 68. wrap () 71. brace () 73. none
 () 69. other (specify)
- O. Accident Occurred During:
 () 74. prepractice () 77. squad scrimmage
 () 75. warm-up () 78. regular game
 () 76. regular practice
- P. Specific Activity During Injury:
 () 79. Tackling () 8. Blocked () 11. Throwing a pass
 () 80. Tackled () 9. Catching a pass () 12. Punting or kicking
 () 6. Carrying the ball () 10. Covering a pass () 13. Other (specify)
 () 7. Blocking
- Q. Facility Area:
 () 14. gymnasium () 15. practice or playing field () 16. other (specify)
- R. Time of Day:
 () 17. before 9:00 a.m. () 19. 12:00-2:59 p.m. () 21. 6:00-8:59
 () 18. 9:00-11:59 () 20. 3:00-5:59 () 22. after 9:00
- S. Distance into Team Season:
 () 23. pre-season () 25. $\frac{1}{4}$ () 27. $\frac{3}{4}$
 () 24. less than $\frac{1}{4}$ () 26. $\frac{1}{2}$ () 28. playoffs
- T. Time of Practice or Game:
 () 29. first $\frac{1}{2}$ of practice () 32. first quarter () 34. third quarter
 () 30. second $\frac{1}{2}$ of practice () 33. second quarter () 35. fourth quarter
 () 31. pre-game warm-up
- U. Temperature:
 () 36. below zero () 39. 40-49° () 42. 70-79°
 () 37. 0-29° () 40. 50-59° () 43. 80-89°
 () 38. 30-39° () 41. 60-69° () 44. above 89°
- V. Type of Field:
 () 45. turf (grass) () 46. dirt
- W. Field Condition(s):
 () 47. wet () 50. soft
 () 48. dry () 51. hard
 () 49. frozen
- X. Type of Facemask:
 () 52. single bar () 53. double bar () 54. cage
- Y. Type of Footwear:
 () 55. high-cut running shoes () 58. low-cut cleats
 () 56. low-cut running shoes () 59. other (specify)
 () 57. high-cut cleats
- Z. Additional Points:
 —player has (recently) incurred similar injury? — () 60. yes () 61. no
 —doctor in attendance at time of injury? — () 62. yes () 63. no
 —trainer in attendance at time of injury? — () 64. yes () 65. no
 —first aid supplies available? — () 66. yes () 67. no
 —injured player insured? — () 68. yes () 69. no

Remarks (circumstances or information not given above)

Names: Coach (or trainer)

Physician

Witness(es)

A Joint Project of
 THE FACULTY OF PHYSICAL EDUCATION, THE UNIVERSITY OF ALBERTA
 with
 THE COMMITTEE FOR THE PREVENTION OF ATHLETIC INJURIES
 ALBERTA SAFETY COUNCIL

APPENDIX B

REPORT FORM INSTRUCTIONAL PAMPHLET

INSTRUCTIONAL PAMPHLET

An instructional pamphlet supplemented the report forms and served to introduce the form, explain the desired definition of injuries placed on the forms, as well as to give instructions on the proper completion of the forms. The necessity for accurate reporting was emphasized in the pamphlet.

FOOTBALL ACCIDENT REPORT FORM

A city-wide survey of football injuries is being conducted during the 1969-70 season, which will be the first study of its kind in Canada. A similar study has been conducted in the United States, but on a national basis, for the past ten years.

The purpose of the study is to collect and analyze data relating to injuries resulting from participation in football so that possible causative factors can be controlled or eliminated. The football accident report form has been devised specifically to examine circumstances in which the injury occurred or to appraise related factors that may result in unwarranted or avoidable injury.

The form has NOT been devised as an instrument to assess or evaluate a coach's or trainer's methods.

The following information is provided to assist coaches and trainers in the accurate completion of the form:

A. For this particular study an INJURED PLAYER WILL BE DEFINED AS ONE WHO, BECAUSE OF A FOOTBALL INJURY:

1. Misses part of practice, or game, or
2. Receives doctor's medical treatment,
(eg. cast, diagnosis, etc.), or
3. Restricted from practice (eg. "sweats," no body contact, etc.).

NOTE: With this definition in mind, it must also be noted that only the REPORTED injuries, that fall into the above definition, are to be recorded.

- B. As well as serving as a survey device, the form can also be used as an accident report form, such as in the case of legal matters.
- C. The form has been carefully drawn up on consultation and revision of existing forms and takes only about two minutes to complete per injury.

The form, which consists of BOTH sides of a single page is divided into three general areas:

1. Player information (eg. age, weight, etc.)
 2. Injury information (eg. body region, etc.)
 3. Environment information (eg. temperature, field conditions, etc.).
- D. Only those items that apply to the majority of cases were included. Where the answer is not given, space is provided to complete the section.
 - E. Some items may require more than one answer as indicated.
 - F. Place a CHECK in the brackets provided when filling out the appropriate answers. DO THIS AS CAREFULLY AND ACCURATELY AS POSSIBLE.
 - G. Fill forms out as soon after the accident as possible.
 - H. Completed forms will be collected on a weekly basis. Results will be tabulated and analyzed by computer. Season results can be made available to a particular team.

NOTE:

Should any problems or difficulties arise, please phone Larry Dufresne at 488-3919, or Ken Van Loon at 482-2620.

APPENDIX C
COMPUTER PROGRAMS

COMPUTER PROGRAMS

A computer program was devised to accomplish data card punching, overall compilations, two section comparisons and three section comparisons. Fortran IV computer language was used as was the IBM 360/67 installation at The University of Alberta.

Program One. Program one eliminated the card punching technique described on the comment cards of program two. All factors on the accident form were numbered and recorded in their order of appearance on a single 80 column IBM hollerith card. Sixty columns were used. All cards run behind program one were repunched according to the comment card specifications and three new cards were issued for each one read into the computer.

Program Two. The new card deck (from program one) was placed behind program two and provided for overall accumulations of each section. A systematic two section comparison followed, in which each section was compared to every other section on the report form.

Program Three. This program utilized the same data deck as program two, however three section analysis was accomplished, in which any one section and its factors was compared to any two other sections and their factors. Because of the vastness of this third program, three section comparisons were selected by the investigator.

(Programs may be obtained from the Faculty of Physical Education of The University of Alberta, Edmonton, Alberta).

APPENDIX D
FATALITY CASE-STUDY

FOOTBALL FATALITY CASE-STUDY

A 17-year old high school football player collapsed while warming up for a game on October 10, shortly before 5:00 p.m. Chest massage was applied at the scene while a doctor and nurse attempted to revive the youth. He was pronounced dead upon arrival at a hospital.

An autopsy revealed the youth died from a congenital heart condition. The death was not attributed directly to football.

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